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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/625,761	07/23/2003	Thomas A. Bachman II	ANCO / 67US	7840
26875	7590	09/08/2005	EXAMINER	
WOOD, HERRON & EVANS, LLP 2700 CAREW TOWER 441 VINE STREET CINCINNATI, OH 45202			SHINGLETON, MICHAEL B	
			ART UNIT	PAPER NUMBER
			2817	

DATE MAILED: 09/08/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

**Office Action Summary**

Application No.

10/625,761

Applicant(s)

BACHMAN ET AL.

Examiner

Michael B. Shingleton

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

**Period for Reply**

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

**Status**

- 1) ☒ Responsive to communication(s) filed on 22 June 2005.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

**Disposition of Claims**

- 4) ☒ Claim(s) 1,2,4-19,21-35 and 37-42 is/are pending in the application.
- 4a) Of the above claim(s) 13-16 and 30-33, is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1, 2, 4-12, 17-19, 21-29, 34, 35 and 37-42 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

**Application Papers**

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on \_\_\_\_\_ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

**Priority under 35 U.S.C. § 119**

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some \* c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
  2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
  3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

**Attachment(s)**

- |  |   |
|--|---|
| 1) <input type="checkbox"/> Notice of References Cited (PTO-892)   | 4) <input type="checkbox"/> Interview Summary (PTO-413)<br>Paper No(s)/Mail Date. _____ |
| 2) <input type="checkbox"/> Notice of Draftperson's Patent Drawing Review (PTO-948)                                    | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152)             |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)<br>Paper No(s)/Mail Date _____ | 6) <input type="checkbox"/> Other: _____  |

## DETAILED ACTION

### *Claim Rejections - 35 USC § 103*

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

Claims 1, 2, 4, 6-12, 17-19, 21, 23-29, 34, 35 and 37-42 are rejected under 35 U.S.C. 103(a) as being unpatentable over Lohita et al. "Power Amplifier Linearization using Cubic Spline Interpolation" (Lohita) of record in view of Shvarts et al. 6,788,151 (Shvarts).

Figure 1 and the relevant text of Lohita disclose a predistorter/amplifier system/ method configured to be used with an RF amplifier (RF Amp) having an input loop composed of the input signal power  $IV_m I^2$  sensor and the look-up table named "Predistorter". The "in response to an monotonically increasing function of the input signal" limitation is as disclosed by applicant in the instant specification as the sensing of power and thus Lohita has such a function. Applicant also calls this sensing of power a "scalar" and this sensing of power in Lohita is a scalar value. Lohita uses this sensing to point to the look-up table coefficients (See page 677 left hand column, first full paragraph.) and provide the predistortion to the input signal to correct the RF power amplifier's output signal. Now while the Lohita reference does not say that the intermodulation (IM) distortion product is directly measured neither do the claims of the instant application. Note the response to applicant's arguments below. The sensing of the output in Lohita and the application of this to the AM-AM & AM-PM estimator to adapt the coefficients in the look-up table will affect the IM distortion product. Thus the newly added limitation "values in the look-up table responsive to the measured intermodulation distortion product" is clearly met by Lohita because Lohita measures the IM distortion product in an indirect way and Lohita clearly states that look-up table values are determined from the sensing of the amplifier output. Lohita recites in the last paragraph of page 677 that it is the third-order and the fifth-order Im products that are measured. The first full paragraph on the right hand column of page 677 of Lohita discloses the use of spline interpolation to update or form the predistortion values in the look-up table. "Predistortion coefficients, are computed using the estimated AM-AM and AM-PM characteristics" and thus the spline function of Lohita involves analyzing amplitude to amplitude (AM-AM) and amplitude to phase (AM-PM) predistortion curves. The input signal of Lohita is clearly I and Q. Figure 1 of Lohita clearly shows all

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the structure of claims like claim 12 except for the use of two D/A converters for the I and Q outputs from the unmarked complex multipliers. The dual input D/A converter of Lohita must be composed for two D/A converters, however, given the art recognized equivalence of two D/A converters for a single dual input D/A converter it would have been obvious to one of ordinary skill in the art at the time the invention was made to have utilized two D/A converters for the dual input D/A converter of Lohita. Lohita is silent on the use of a gradient search to come up with the coefficients. However, the use of a gradient search is on well-known method to come up with the predistortion coefficients. Accordingly, it would have been obvious to one of ordinary skill in the art at the time the invention was made to have utilized a gradient search method to come up with the coefficients as these is a well known art recognized equivalent way to come up with the coefficients. Claims like claim 9 and 10 recite that the spline function is updated, i.e. a “knot” is formed by measuring the intermodulation distortion product and that the knots are formed for various input power levels. As noted above the sensing of the output is in effect the sensing of the intermodulation distortion product in an indirect way. It is clear from Lohita that the coefficients are constantly updated and thus knots are formed. Claims like claim 17 recite that the threshold detector is configured with a high power threshold and a low power threshold. This is very broad limitation for the power sensor of Lohita would have a lower limit i.e. low power threshold and an upper limit, i.e. a high power threshold. Lohita clearly senses the power between these limits and as noted below the Shvarts reference clearly teaches the use of the power sensing arrangement to control the power supply voltage to the power amplifier. Thus, it is an obvious consequence that the combination made obvious below would have a selectable voltage based on at least the high power threshold i.e. the upper limit of the sensor and low power threshold i.e. the lower limit of the sensor.

Lohita is silent on the use of an anti-clipping or “peak control circuit” so as to prevent clipping and the added distortion that this would introduce.

Figure 1 A and the relevant text of Shvarts however, discloses a anti-clipping arrangement that like the present invention uses the sensed input power to determine the power supply voltage to be applied to the power amplifier so as to provide the necessary headroom for the amplifier which prevents clipping. See abstract. Also note column 1 around line 40 that equates no clipping with no distortion. Clipping is well known to cause distortion and it is just common engineering sense to prevent clipping in amplifiers to prevent the distortion caused by clipping.

Thus it would have been obvious to one of ordinary skill in the art at the time the invention was made to have provided Lohita with a anti-clipping arrangement that changes the power supply voltage to

the amplifier in response to the sensed input power level like that of Shvarts so as to prevent clipping and the distortion caused thereby as taught by Shvarts.

### *Double Patenting*

The nonstatutory double patenting rejection is based on a judicially created doctrine grounded in public policy (a policy reflected in the statute) so as to prevent the unjustified or improper timewise extension of the "right to exclude" granted by a patent and to prevent possible harassment by multiple assignees. See *In re Goodman*, 11 F.3d 1046, 29 USPQ2d 2010 (Fed. Cir. 1993); *In re Longi*, 759 F.2d 887, 225 USPQ 645 (Fed. Cir. 1985); *In re Van Ornum*, 686 F.2d 937, 214 USPQ 761 (CCPA 1982); *In re Vogel*, 422 F.2d 438, 164 USPQ 619 (CCPA 1970); and, *In re Thorington*, 418 F.2d 528, 163 USPQ 644 (CCPA 1969).

A timely filed terminal disclaimer in compliance with 37 CFR 1.321(c) may be used to overcome an actual or provisional rejection based on a nonstatutory double patenting ground provided the conflicting application or patent is shown to be commonly owned with this application. See 37 CFR 1.130(b).

Effective January 1, 1994, a registered attorney or agent of record may sign a terminal disclaimer. A terminal disclaimer signed by the assignee must fully comply with 37 CFR 3.73(b).

Claims 1, 2, 4-12, 17-19, 21-29, 34, 35 and 37-42 are provisionally rejected under the judicially created doctrine of obviousness-type double patenting as being unpatentable over claims 1-32 of copending Application No. 10/342,633 in view of Shvarts et al. 6,788,151 (Shvarts).

Claims 1-39 of the '633 application sets forth the same basic predistorter arrangement as claimed in the present application except for the addition of the anti-clipping circuit referred to by applicant as 70 in the instant application.

Figure 1 A and the relevant text of Shvarts however, discloses a anti-clipping arrangement that like the present invention uses the sensed input power to determine the power supply voltage to be applied to the power amplifier so as to provide the necessary headroom for the amplifier which prevents clipping. See abstract. Also note column 1 around line 40 that equates no clipping with no distortion. Clipping is well known to cause distortion and it is just common engineering sense to prevent clipping in amplifiers to prevent the distortion caused by clipping.

Thus it would have been obvious to one of ordinary skill in the art at the time the invention was made to have provided The '633 application with a anti-clipping arrangement that changes the power supply voltage to the amplifier in response to the sensed input power level like that of Shvarts so as to prevent clipping and the distortion caused thereby as taught by Shvarts.

This is a provisional obviousness-type double patenting rejection.

Applicant's arguments filed 6-22-2005 have been fully considered but they are not persuasive. Applicant states that "Lohita does not disclose the actual measurement of an intermodulation IM distortion product and an update of predistortion values responsive to that measured intermodulation distortion product". The examiner respectfully disagrees for the claims only recites that "the output loop configured to measure an intermodulation distortion product of the RF power amplifier output". The disclosed present invention does this by multiplying a local oscillator to the sensed output of the amplifier and obtaining the baseband frequency range (Note element 48). The Lohita also involves a local oscillator and unshown multiplier to obtain the baseband frequency range in the same conventional manner. Thus, even though Lohita is silent on saying that the actual IM distortion is measured by the output loop, the fact is that given the similarity of structure between the Lohita reference and applicant's invention, Lohita does do an actual measurement of the IM distortion product and as recited in the bottom most right-hand paragraph in Lohita the look-up table values are obtained from this output loop and thus updates the look-up table values from what there were previously response to the measured intermodulation distortion product. Also note that actual third and fifth order intermodulation products are obtained directly using two test tones as recited at the bottom of page 677 of Lohita. In addition as stated previously the claims recite an output loop to measure an intermodulation distortion product and now are amended to recite the additional feature that the values in the look-up table are "responsive to the measured intermodulation distortion product" but the claims do not state that the actual intermodulation distortion product is directly measured. It is clear from Figures like Figure 4 of Lohita that the actual measurements of the AM-AM and AM-PM characteristics (Note the comparison of the i and q signals at the bottom left-hand side of page 677 of Lohita.) is in fact a measurement of the actual intermodulation products for Figure 4 of Lohita clearly shows that when the AM-AM and AM-PM characteristics are improved so must the intermodulation products. Also note as stated above the look-up table values are obtained from the measurement at the output of the amplifier which as also noted above is a measurement of the intermodulation distortion product. The examiner must give the broadest reasonable interpretation to the claimed invention (See MPEP 2111.). The claims just do not say that the intermodulation distortion product is directly measured as applicant seem to suggest nor does applicant point out the differences in the structure of the present invention and the Lohita reference. As noted above they both employ local oscillators that is used to obtain the baseband frequency i.e. the output of the amplifier is multiplied with

the local oscillator. Also it is noted that the paragraph bridging pages 12 and 13 of the specification appear to recite that the sensing arrangement of the instant application is effectively analyzing the amplitude to amplitude and amplitude to phase distortion curves. This sounds a lot like Lohita.

Applicant states "Shvarts is cited merely for disclosing a variable power amplifier, and indeed this reference does not address the measurement of IMD products and the updating of predistortion values responsive to such measurements. Thus, Shvarts fails to add anything to the rejection with respect to this claimed concept. Furthermore, with respect to the concept of a variable power supply, Applicants submit that Shvarts fails to suggest the use of its variable power supply in connection with an adaptive predistorter having an input loop as specified in claim 1." It appears that applicant is arguing that Shvarts does not anticipate the claimed invention. This is true for the Shvarts recites a supply voltage arrangement that can be used in a variety of power amplifiers so as to "provide a substantially constant voltage supply headroom for the amplifier". Just because Shvarts does not anticipate the claimed invention, i.e. it includes the input loop as specified in claim 1 does not take away from the teaches of Shvarts and does not mean that Shvarts can not be combined with a reference that includes the input loop as specified in claim 1.

It is noted that applicant has not filed a terminal disclaimer and the examiner still maintains for the reasons above that the addition of a peak control circuit coupled to the input loop is an obvious addition to the claimed invention of the '633 application.

Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire **THREE MONTHS** from the mailing date of this action. In the event a first reply is filed within **TWO MONTHS** of the mailing date of this final action and the advisory action is not mailed until after the end of the **THREE-MONTH** shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than **SIX MONTHS** from the date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Michael B. Shingleton whose telephone number is (571) 272-1770.

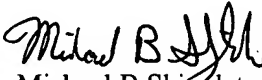
If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Robert Pascal, can be reached on (571)272-1769. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306 and after July 15, 2005 the fax number will be 571-273-8300. Note that old fax number (703-872-9306) will be service until September 15, 2005.

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Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

MBS

August 25, 2005

  
Michael B Shingleton  
Primary Examiner  
Group Art Unit 2817